

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Toshiyuki TSUBOUCHI, et. al.

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For : TRACTION DRIVE FLUID COMPOSITIONS

Art Unit & Examiner : 1764, Ellen M McAvoy

DECLARATION UNDER 37 C.F.R. 1.132

COMMISSIONER FOR PATENTS

ALEXANDRIA, VIRGINIA 22313

Sir:

Now comes Toshiyuki Tsubouchi who deposes and states that:

1. I am a graduate of Kyushu University and received my Doctor's degree in the year 1995.

2. I have been employed by Idemitsu Kosan Co. Ltd. for 34 years as a researcher in the field of synthetic lubricants.

3. I understand the English language.

4. The following experiments were carried out by me or under my direct supervision.

[Experimental results]

The Fluid A and the Fluid B were synthesized by the method described in the specification pages 10-11 (Fluid A) and pages 11-12 (Fluid B). The traction coefficient was measured according to the method described in the specification page 17. The ultrasonic shear stability was measured according to JPI-5S-29-88.

Example A (an inventive embodiment)

Into an autoclave having a capacity of one liter was placed 15 g of a hydrogenation nickel / diatomaceous earth catalyst (available from Nikki Chemical Industrial Co., Ltd. under the trade name N-113), 20 g of polystyrene (Mw: 160,000) and 500 milliliter of cyclohexane to carry out hydrogenation reaction under a hydrogen pressure of 6 MPa · G at a reaction temperature of 250°C for 3.5 hours. After cooling the reaction product, the catalyst was removed by filtration and the filtrate was subjected to evaporation to bone dryness, followed by vacuum distillation to obtain 19 g of hydrogenated polystyrene (hereinafter referred to as Polymer I). As the result of the measurement thereof by means of GPC, the Polymer I had a weight average molecular weight of 8,900 expressed in terms of polystyrene. The Polymer I at a ratio of 1.5% by mass was mixed with the Fluid A to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 4, Table 1-1.

Example B (an inventive embodiment)

The procedure in Example A was repeated except the hydrogenation reaction was performed at a reaction temperature of 200°C for 4.5 hours. Thus there was obtained 19 g of hydrogenated polystyrene (hereinafter referred to as Polymer II). As the result of the measurement thereof by means of GPC, the Polymer II had a weight average molecular weight of 29,700 expressed in terms of polystyrene. The Polymer II at a ratio of 1.5% by mass was mixed with the Fluid A to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 4, Table 1-1.

Example C (an inventive embodiment)

The procedure in Example A was repeated except the hydrogenation

reaction was performed for 1.1 hours using 20 g of an ethylene / styrene copolymer (styrene 63 mol%, Mw: 160,000) in place of 20 g of polystyrene (Mw: 160,000). Thus there was obtained 19 g of hydrogenated product of ethylene / styrene copolymer (hereinafter referred to as Polymer III). As the result of the measurement thereof by means of GPC, the Polymer III had a weight average molecular weight of 8,560 expressed in terms of polystyrene. The Polymer III at a ratio of 1.5% by mass was mixed with the Fluid A to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 4, Table 1-1.

Example D (an inventive embodiment)

The procedure in Example A was repeated except the hydrogenation reaction was performed for 15 minutes using 20 g of an ethylene / styrene copolymer (styrene 63 mol%, Mw: 160,000) in place of 20 g of polystyrene (Mw: 160,000). Thus there was obtained 19 g of hydrogenated product of ethylene / styrene copolymer (hereinafter referred to as Polymer IV). As the result of the measurement thereof by means of GPC, the Polymer IV had a weight average molecular weight of 26,034 expressed in terms of polystyrene. The Polymer IV at a ratio of 1.5% by mass was mixed with the Fluid A to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 4, Table 1-1.

Example E (an inventive embodiment)

Polymer I obtained in Example A at a ratio of 1.5% by mass was mixed with the Fluid B to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 5, Table 1-2.

Example F (an inventive embodiment)

Polymer II obtained in Example B at a ratio of 1.5% by mass was mixed with the Fluid B to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 5, Table 1-2.

Example G (an inventive embodiment)

Polymer III obtained in Example C at a ratio of 1.5% by mass was mixed with the Fluid B to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 5, Table 1-2.

Example H (an inventive embodiment)

Polymer IV obtained in Example D at a ratio of 1.5% by mass was mixed with the Fluid B to obtain a fluid composition. The properties of the fluid composition, the result of the ultrasonic shear stability test, and the result of the traction coefficient measurement, are given at Declaration page 5, Table 1-2.

[Table 1-1]

Example	Reference Ex. 1	A	B	C	D
Base oil	Fluid A	Fluid A	Fluid A	Fluid A	Fluid A
Polymer		Polymer I	Polymer II	Polymer III	Polymer IV
Kinematic viscosity @ 40°C, mm ² /s	17.32	19.79	22.79	20.69	24.15
Kinematic viscosity @ 100°C, mm ² /s	3.578	3.944	4.519	4.080	4.691
Viscosity index	77	88	111	92	112
Viscosity decrease after shear stability test, %	-0.1	-0.5	-3.6	-0.4	-3.2
Traction coefficient @ 140°C	0.077	0.077	0.077	0.077	0.077

[Table 1-2]

Example	Reference Ex. 2	E	F	G	H
Base oil	Fluid B	Fluid B	Fluid B	Fluid B	Fluid B
Polymer	-	Polymer I	Polymer II	Polymer III	Polymer IV
Kinematic viscosity @ 40°C, mm ² /s	20.23	23.88	27.68	24.17	26.41
Kinematic viscosity @ 100°C, mm ² /s	3.572	4.023	4.595	4.030	4.530
Viscosity index	13	25	66	26	72
Viscosity decrease after shear stability test, %	-0.1	-0.5	-3.6	-0.4	-3.2
Traction coefficient @ 140°C	0.070	0.070	0.070	0.070	0.070

Polymer I: hydrogenated polystyrene, Mw 8,900

Polymer II: hydrogenated polystyrene, Mw 29,700

Polymer III: hydrogenated product of ethylene / styrene copolymer, Mw 8,560

Polymer IV: hydrogenated product of ethylene / styrene copolymer, Mw 26,034

As described in Table 1-1 of this Declaration, in inventive Examples A-D, when polymer is added to the base oil A (e.g., Fluid A), the traction coefficient remained the same (that is, the traction coefficient did not decrease). Similarly, as described in Table 1-2 of this Declaration, in inventive Examples E-G, when polymer is added to the base oil B (e.g., Fluid B), the traction coefficient remained the same (that is, the traction coefficient did not decrease). These superior results of adding polymer and not having the traction coefficient decrease were unexpected.

5. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by

fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Further deponent saith not.

Signature Toshiyuki Tsubouchi
Toshiyuki TSUBOUCHI

Date July 31, 2009